Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

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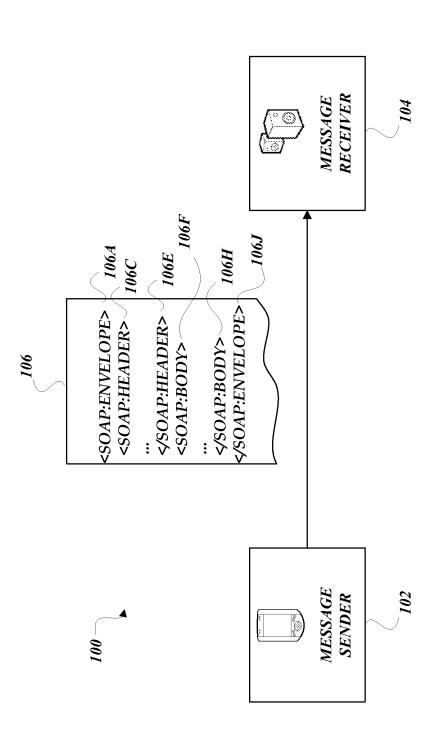
100

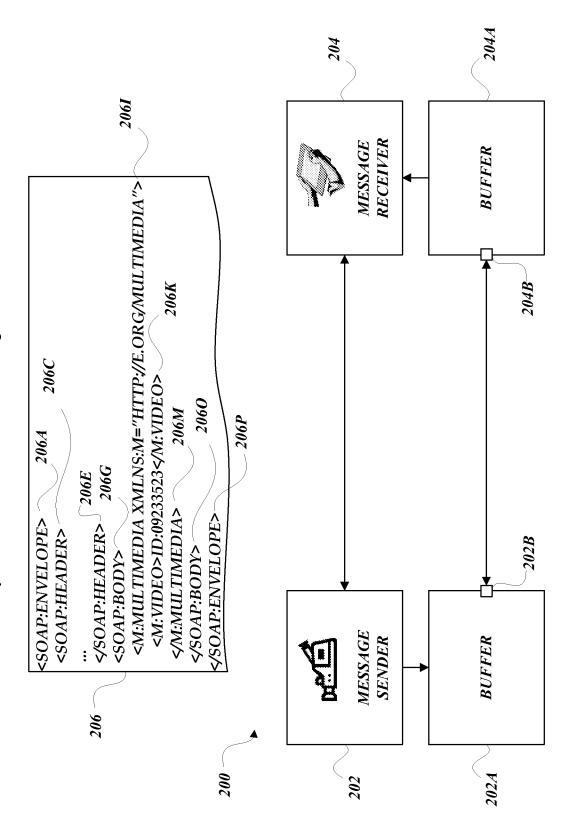*106*

```
<SOAP:ENVELOPE>        106A
 <SOAP:HEADER>         106C
 ...
 </SOAP:HEADER>        106E
 <SOAP:BODY>           106F
 ...
 </SOAP:BODY>          106H
</SOAP:ENVELOPE>       106J
```

MESSAGE
RECEIVER

104

MESSAGE
SENDER

102

Fig.1.

(PRIOR ART)

```
<SOAP:ENVELOPE>              206A
    <SOAP:HEADER>                  206C
    ...                  206E
    </SOAP:HEADER>           206G
    <SOAP:BODY>
    <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">
        <M:VIDEO>ID:0923523</M:VIDEO>
    </M:MULTIMEDIA>        206M        206K
    </SOAP:BODY>          206O
</SOAP:ENVELOPE>       206P
```

206I

206

200

MESSAGE
SENDER

202

BUFFER

202A

202B

MESSAGE
RECEIVER

204

BUFFER

204A

204B

Fig.2A.

```
<SO206ANVELOPE>   206C
  <SOAP:HEADER>
  206E    ...
  206G  <SOAP:HEADER>
        <SOAP:BODY>
  <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">
  <M:VIDEO>ID:0923523</M:VIDEO>   206K
      </M:N206MIMEDIA>
      <SOA206ODY>
      </SOAP:ENVELOPE>   206P
```

206I

206

MESSAGE SENDER 202

202A

BUFFER 202B

INTERMEDIARY 208

MESSAGE RECEIVER 204

204A

BUFFER 204B

Fig.2B.

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```
<SOAP:ENVELOPE>          206A
  <SOAP:HEADER>     206C
    <R:BUFFER ID="ID1">        206R
      <R:ENDPOINT>ID:09233523</R:ENDPOINT>          206T
    </R:BUFFER>     206E
  </SOAP:HEADER>      206X
  <SOAP:BODY>      206G
    <M:MULTIMEDIA XMLNS:M="HTTP://E.ORG/MULTIMEDIA">       206I
      <M:VIDEO HREF="#ID1"/>       206V
    </M:MULTIMEDIA>     206M
  </SOAP:BODY>      206O
</SOAP:ENVELOPE>      206P
```

207

Fig.2C.

MESSAGE RECEIVER   204

BUFFER   204A

204B

208C

INTERMEDIARY   208

STAGING BUFFER   208A
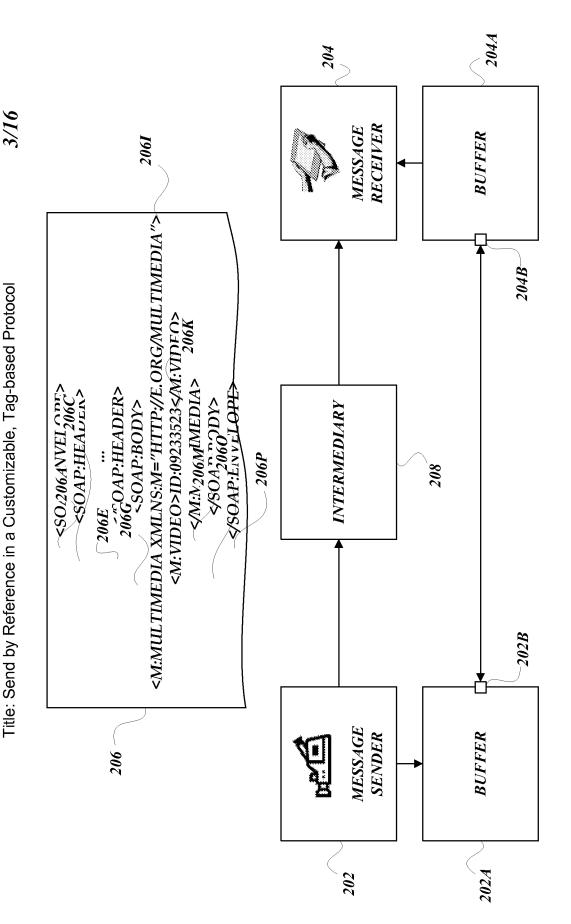
MESSAGE SENDER   202

BUFFER   202A

202B

208B

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
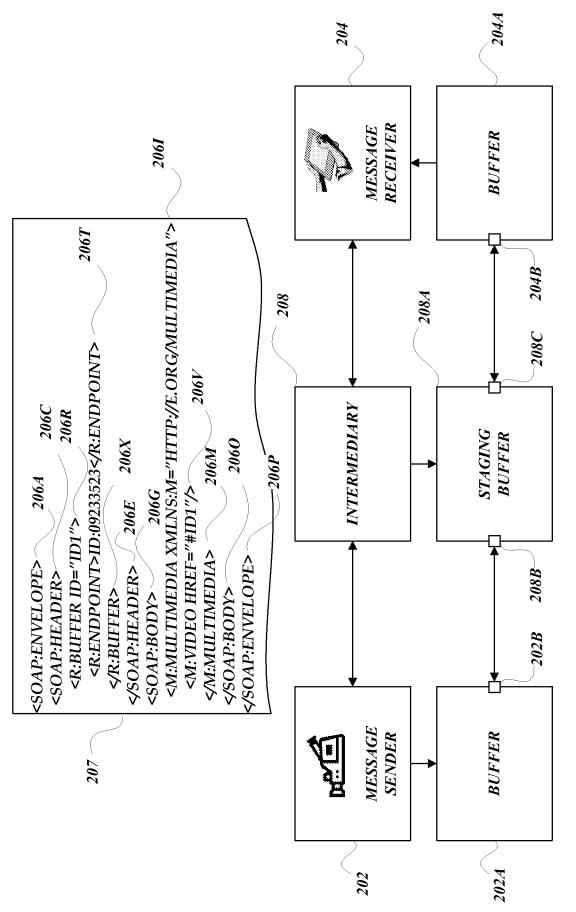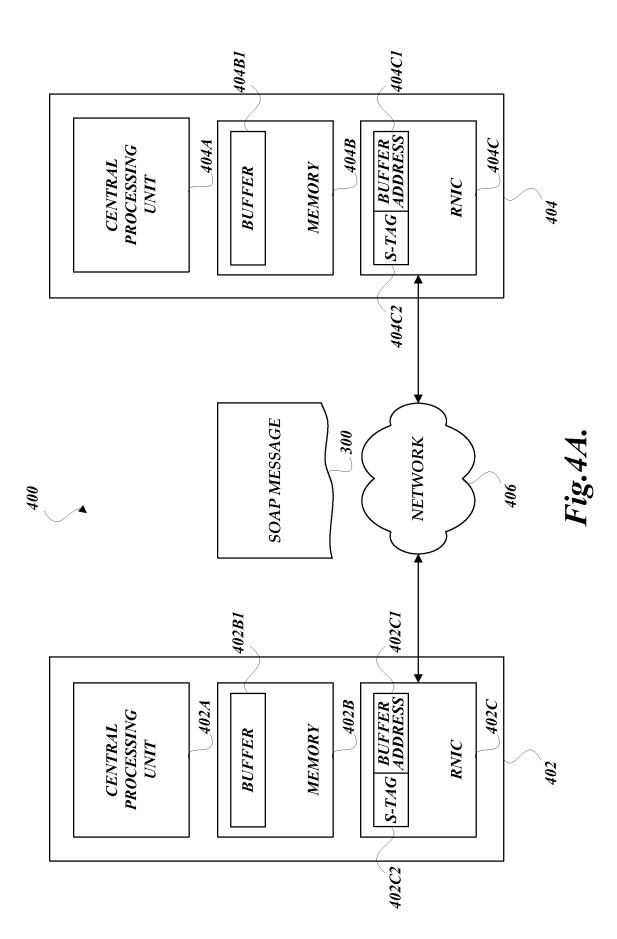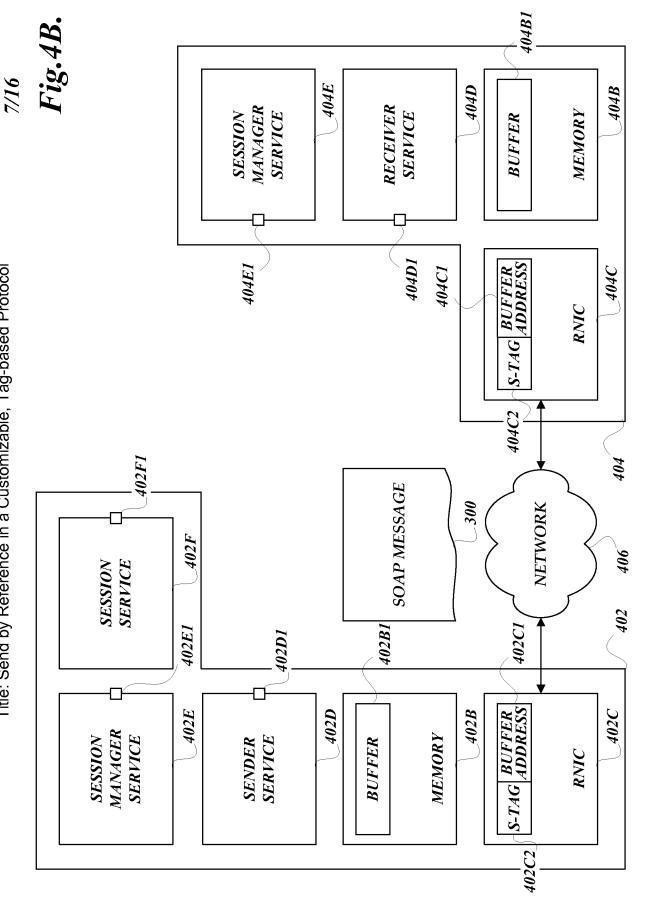Title: Send by Reference in a Customizable, Tag-based Protocol

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300

```
<SOAP:ENVELOPE XMLNS:S="HTTP://WWW.W3.ORG/2003/05/SOAP-ENVELOPE">          302
<SOAP:HEADER>                                                             304
  <R:RDMA XMLNS:R="HTTP://MAGNET/CONTRACTS/2003/08/RDMA.XSD">             306
    <R:SERVICEINFO SERVICE="RDMAP:09233523-345B-4351-B623-5DSF35SGS5D6">  308
      <R:HOST>EXAMPLE.COM</R:HOST>                                        310
      <R:PROTOCOL>6</R:PROTOCOL>                                          312
      <R:PORT>808</R:PORT>                                                314
      <R:CONTRACT>HTTP://EXAMPLE.ORG/RDMA/READ</R:CONTRACT>               316
      <R:TAG>983452346</R:TAG>                                            318
      <R:LENGTH>231245646</R:LENGTH>                                      320
    </R:SERVICEINFO>                                                      322
  </R:RDMA>                                                               324
</SOAP:HEADER>                                                            326
<SOAP:BODY>                                                               328
  <M:MULTIMEDIA XMLNS:M="HTTP://EXAMPLE.ORG/MULTIMEDIA">                  330
    <M:VIDEO>RDMAP:09233523-345B-4351-B623-5DSF35SGS5D6</M:VIDEO>         332
  </M:MULTIMEDIA>                                                         334
</SOAP:BODY>                                                              336
</SOAP:ENVELOPE>                                                          338
```

Fig.3.

400

SOAP MESSAGE

300

NETWORK

406

CENTRAL PROCESSING UNIT

404A

BUFFER

404B1

MEMORY

404B

S-TAG | **BUFFER ADDRESS**

404C1

RNIC

404C

404

404C2

CENTRAL PROCESSING UNIT

402A

BUFFER

402B1

MEMORY

402B

S-TAG | **BUFFER ADDRESS**

402C1

RNIC

402C

402

402C2

Fig.4A.

Fig.4B.

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START A METHOD FOR
SENDING BY REFERENCE IN A CUSTOMIZABLE,
TAG-BASED PROTOCOL

500

Ⓐ

A SENDER SERVICE PREPARES A MESSAGE
WITH ONE OR MORE REFERENCES TO ONE
OR MORE BUFFERS (SEE FIGS. 5B-5D)

502

Ⓑ

Ⓒ

AN INTERMEDIATE NODE PROCESSES THE
MESSAGE WITH ONE OR MORE REFERENCES
TO ONE OR MORE BUFFERS (SEE FIGS. 5E-
5F)

504

Ⓓ

Ⓔ

A RECEIVER SERVICE PROCESSES THE
MESSAGE WITH ONE OR MORE REFERENCES
TO ONE OR MORE BUFFERS (SEE FIGS. 5G-5I)

506

Ⓕ

FINISH

Fig.5A.

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500

(A)

A SENDER SERVICE AT A FIRST NODE
FINDS A SESSION MANAGER SERVICE
FROM A DIRECTORY — 508

THE SENDER SERVICE ISSUES A
CREATE TRANSFER SESSION
REQUEST TO THE SESSION
MANAGER SERVICE — 510

THE CREATE TRANSFER SESSION REQUEST IS
SENT ALONG WITH PARAMETERS IDENTIFYING
THE URI OF THE RECEIVER SERVICE AT A
SECOND NODE — 512

THE SESSION MANAGER SERVICE RECEIVES THE
CREATE TRANSFER SESSION REQUEST ALONG WITH
PARAMETERS IDENTIFYING THE URI OF THE
RECEIVER SERVICE — 514

THE SESSION MANAGER
ISSUES A MAPPING
REQUEST TO A NETWORK
MANAGER — 516

THE MAPPING REQUEST IS SENT
ALONG WITH THE URI OF THE
RECEIVER SERVICE AND AN ADDRESS
OF A LOCAL BUFFER — 518

THE NETWORK MANAGER PASSES THE
ADDRESS OF THE LOCAL BUFFER TO
A RNIC AND REQUESTS A STEERING
TAG — 520

(A1)

Fig.5B.

Replacement Sheet
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(A1)

THE RNIC ASSOCIATES A STEERING TAG WITH THE
ADDRESS OF THE LOCAL BUFFER AND RETURNS THE
STEERING TAG ALONG WITH A NETWORK PORT
NUMBER — 522

THE SESSION MANAGER CREATES A SESSION
SERVICE WITH A URI WHICH CAN PROVIDE A
TRANSFER CONTEXT (TO BE CREATED) — 524

THE SESSION MANAGER CREATES A TRANSFER
CONTEXT, WHICH RELATES THE STEERING TAG
WITH THE ADDRESS OF THE LOCAL BUFFER — 526

THE SESSION SERVICE IN ESSENCE REPRESENTS THE
LOCAL BUFFER ALLOWING OTHER SERVICES TO QUERY
FOR META DATA INFORMATION, SUCH AS THE TRANSFER
CONTEXT — 528

THE SESSION MANAGER ISSUES A CREATE TRANSFER
SESSION RESPONSE TO THE SENDER SERVICE (ALONG IS
SENT THE URI OF THE SESSION SERVICE AND THE
TRANSFER CONTEXT) — 530

THE SENDER SERVICE RECEIVES THE CREATE
TRANSFER SESSION RESPONSE ALONG WITH THE
URI OF THE SESSION SERVICE AND THE TRANSFER
CONTEXT — 532

Fig.5C.

(A2)

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
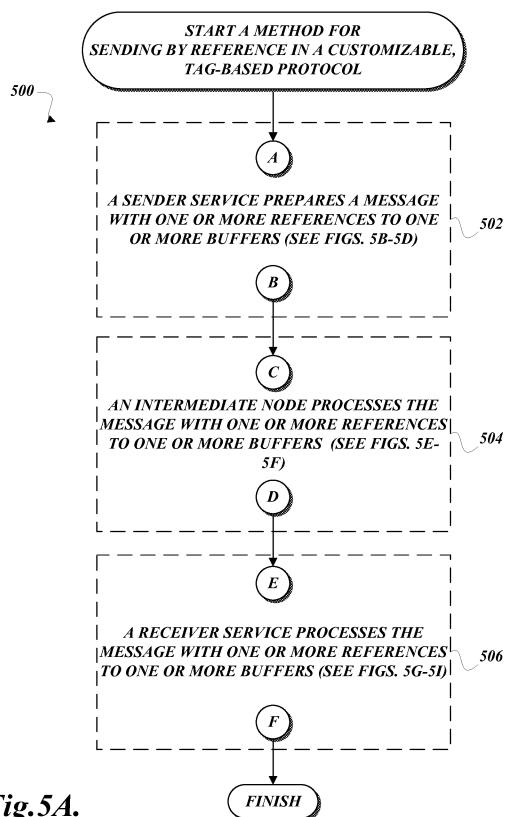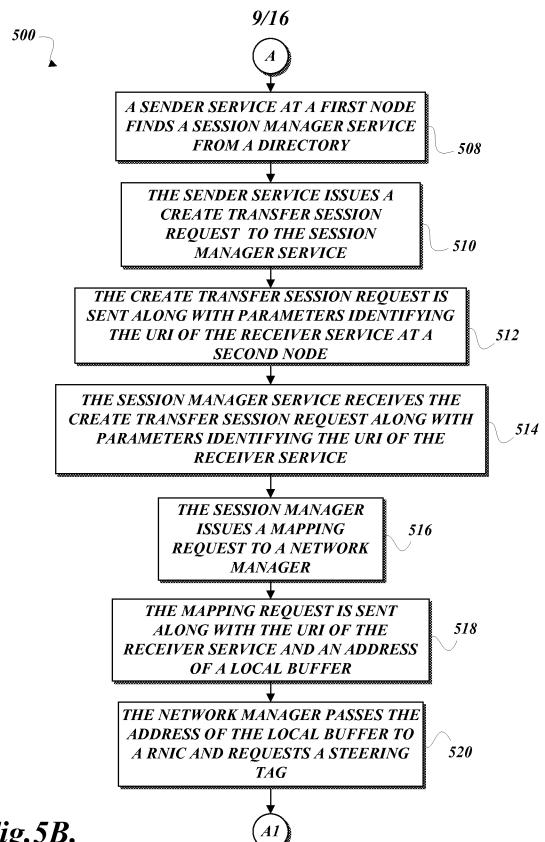Title: Send by Reference in a Customizable, Tag-based Protocol

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500

(A2)

THE SENDER SERVICE CONSTRUCTS THE HEADER OF A SOAP MESSAGE TO CONTAIN THE TRANSFER CONTEXT INCLUDING THE URI OF THE SESSION SERVICE — *534*

THE SENDER SERVICE CONSTRUCTS AN ATTRIBUTE INDICATING A REFERENCE TO THE URI OF THE SESSION SERVICE — *536*

THE SENDER SERVICE CONSTRUCTS A BODY OF THE SOAP MESSAGE WHICH USES THE ATTRIBUTE TO DESCRIBE THE BUFFER — *538*

THE SENDER SERVICE OPTIONALLY ENCODES THE BODY OF THE SOAP MESSAGE TO SECURE FROM UNAUTHORIZED ACCESS — *540*

THE SENDER SERVICE SENDS AN UPDATE REQUEST ALONG WITH THE SOAP MESSAGE CONTAINING THE URI OF THE SESSION SERVICE — *542*

THE RNIC OF THE FIRST NODE SENDS THE SOAP MESSAGE (IN SERIALIZED FORM) ACROSS A NETWORK — *544*

Fig.5D.

(B)

Replacement Sheet
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Title: Send by Reference in a Customizable, Tag-based Protocol

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C

500

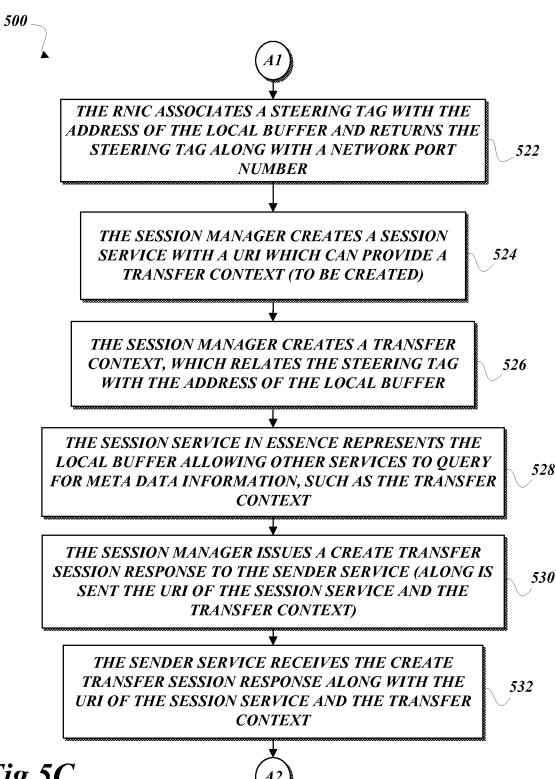IS THERE AN INTERMEDIARY THAT INTERCEPTS THE SOAP MESSAGE? 546

NO

D

YES

DOES THE INTERMEDIARY REQUIRE COMMUNICATION TO GO THROUGH IT ? 548

NO

D

YES

THE RNIC OF THE INTERMEDIARY RECEIVES THE SERIALIZED SOAP MESSAGE AND RECONSTITUTES IT 550

C1

Fig.5E.

Replacement Sheet
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Title: Send by Reference in a Customizable, Tag-based Protocol

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500

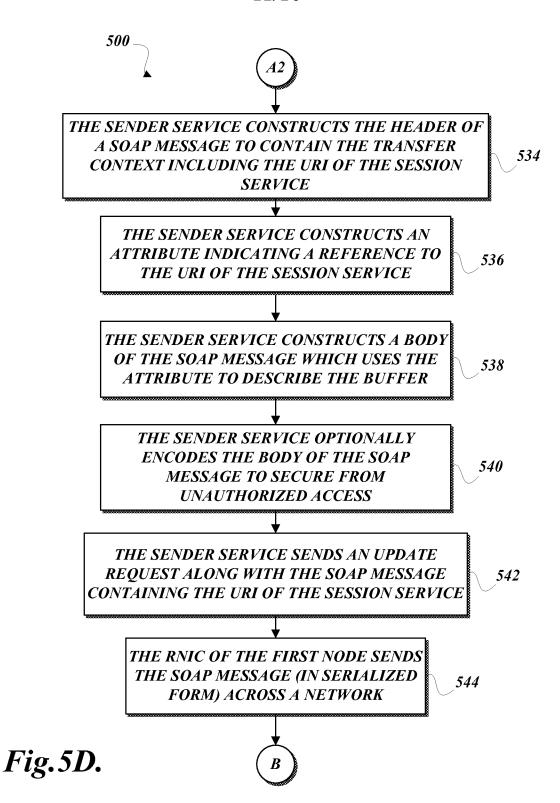(C1)

THE INTERMEDIARY PARSES THE
HEAD OF THE SOAP MESSAGE TO
FIND THE TRANSFER CONTEXT _552

THE INTERMEDIARY REPEATS PROCESSING STEPS 520-532
(FIGS. 5B-5C) BASED ON THE INFORMATION IN THE
TRANSFER CONTEXT TO CREATE A STAGING BUFFER _554

IS THE SOAP
MESSAGE
DELIVERING
INFORMATION? _556

NO

(C)

YES

THE CONTENT OF THE BUFFER OF THE PREVIOUS
TRANSFER CONTEXT IS TRANSFERRED VIA RDMA
INTO THE STAGING BUFFER OF THE INTERMEDIARY _558

THE INTERMEDIARY CHANGES THE HEADER OF
THE SOAP MESSAGE TO INCLUDE THE TRANSFER
CONTEXT CREATED BY THE INTERMEDIARY _560

THE RNIC OF THE INTERMEDIARY SENDS THE
SOAP MESSAGE (IN SERIALIZED FORM) ACROSS
THE NETWORK TOWARD THE DESTINATION _562

(C)

Fig.5F.

Replacement Sheet
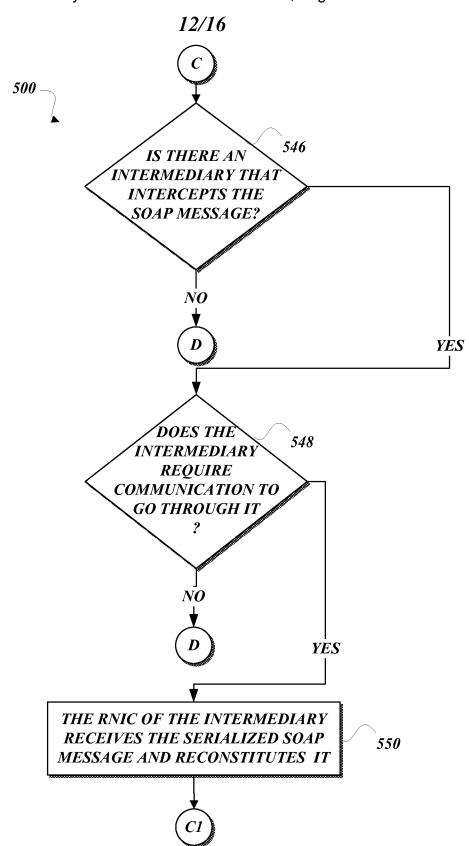S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
Title: Send by Reference in a Customizable, Tag-based Protocol

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500

(E)

THE RECEIVER SERVICE AT THE SECOND
NODE RECEIVES THE UPDATE REQUEST AND
PARSES THE BODY OF THE SOAP MESSAGE — 564

UPON ENCOUNTERING THE ATTRIBUTE IN THE
BODY, THE RECEIVER SERVICE FINDS THE
TRANSFER CONTEXT DESCRIBED IN THE HEADER — 566

IS THE ACTION
ONE OF DELIVERING
INFORMATION? — 568

NO

YES

THE RECEIVER SERVICE ALLOCATES A
LOCAL BUFFER BASED ON THE
INFORMATION IN THE TRANSFER CONTEXT — 570

THE RECEIVER SERVICE LOCATES A LOCAL
BUFFER AT THE SECOND NODE
CONTAINING THE DESIRED INFORMATION — 572

THE RECEIVER SERVICE ISSUES AN INSERT REQUEST TO
A SESSION MANAGER ON THE SECOND NODE (ALONG
WHICH IS SENT THE TRANSFER CONTEXT) — 574

Fig.5G.

(E1)

Replacement Sheet
S/N: 10/717,741 Attorney Docket: MS1-4096US Inventor: Conroy, et al.
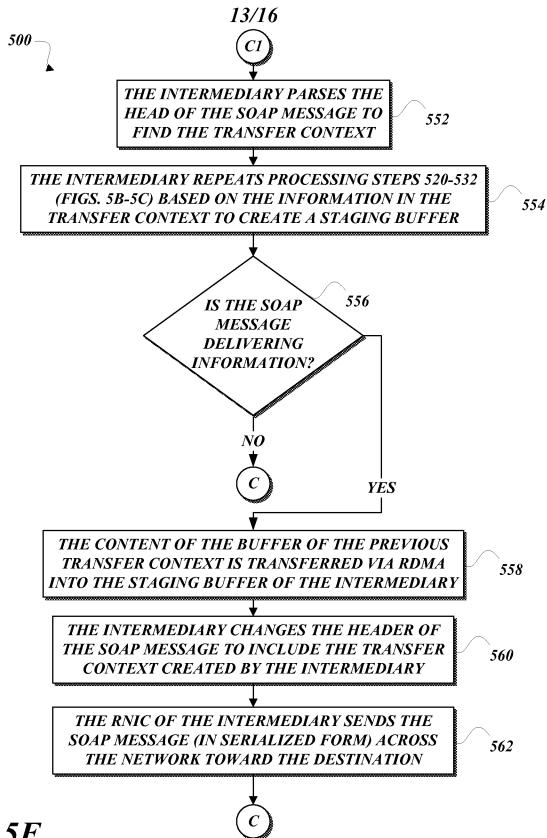Title: Send by Reference in a Customizable, Tag-based Protocol

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500

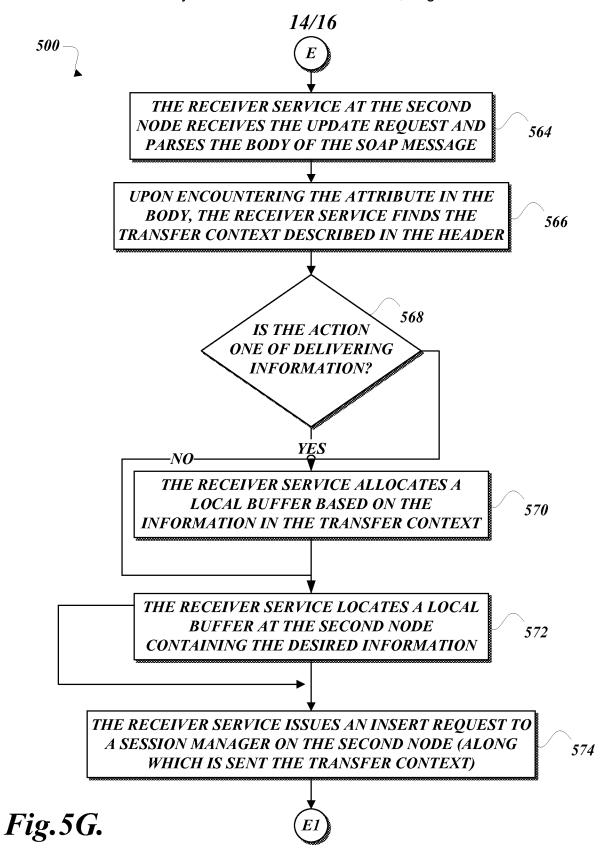(E1)

THE SESSION MANAGER RECEIVES
THE INSERT REQUEST AND PARSES
THE TRANSFER CONTEXT — *576*

THE SESSION MANAGER INVOKES THE NETWORK
MANAGER WHO IN TURNS COMMUNICATES WITH THE
RNIC TO TRANSFER INFORMATION — *578*

IS THE ACTION
ONE OF DELIVERING
INFORMATION? — *580*

YES

NO

THE RNIC AT THE OTHER NODE TRANSFERS
INFORMATION TO THE RNIC AT THE SECOND NODE
USING THE STEERING TAG IN THE TRANSFER CONTEXT — *582*

THE RNIC AT THE SECOND NODE TRANSFERS
INFORMATION TO THE RNIC AT THE OTHER NODE USING
THE STEERING TAG IN THE TRANSFER CONTEXT — *584*

AFTER TRANSFERRING HAS COMPLETED, THE
SESSION MANAGER ISSUES AN INSERT
RESPONSE TO THE RECEIVER SERVICE — *586*

(E2)

Fig.5H.

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(E2)
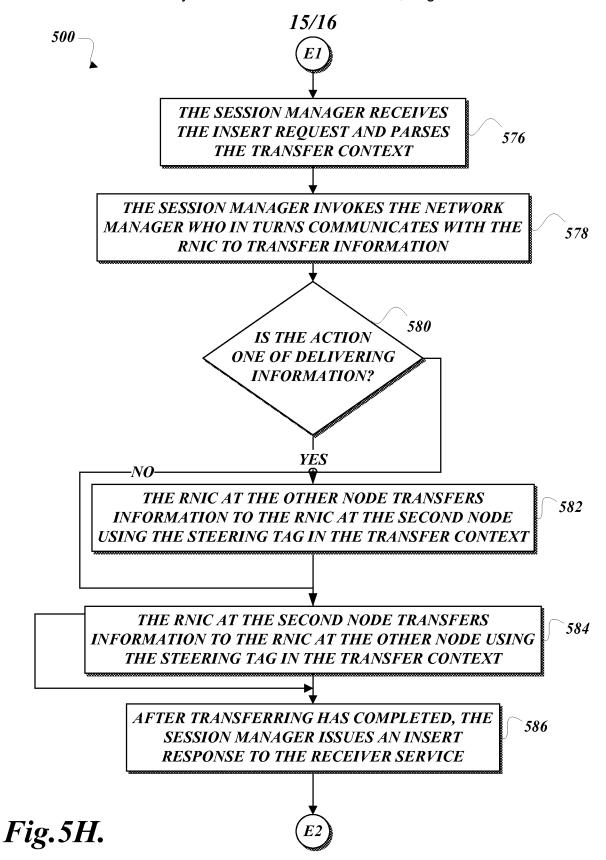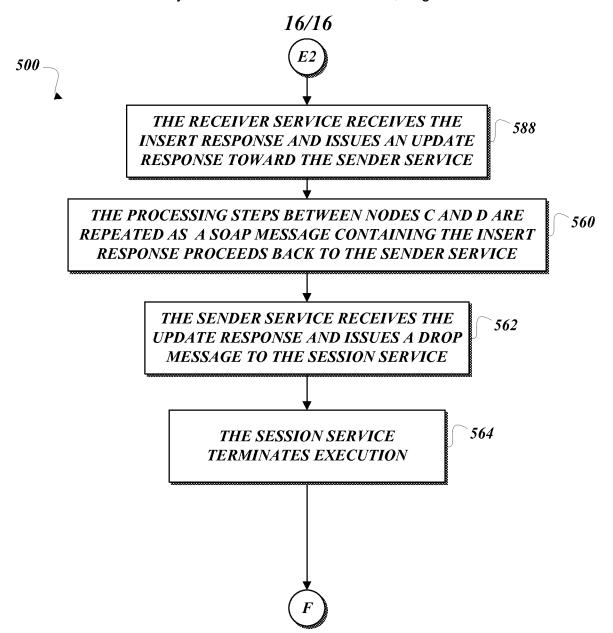
500

THE RECEIVER SERVICE RECEIVES THE
INSERT RESPONSE AND ISSUES AN UPDATE
RESPONSE TOWARD THE SENDER SERVICE ⌐ *588*

THE PROCESSING STEPS BETWEEN NODES C AND D ARE
REPEATED AS A SOAP MESSAGE CONTAINING THE INSERT
RESPONSE PROCEEDS BACK TO THE SENDER SERVICE ⌐ *560*

THE SENDER SERVICE RECEIVES THE
UPDATE RESPONSE AND ISSUES A DROP
MESSAGE TO THE SESSION SERVICE ⌐ *562*

THE SESSION SERVICE
TERMINATES EXECUTION ⌐ *564*

(F)

Fig.5I.